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INFLUENCE OF LEVELS AND APPLICATION TECHNIQUES OF K ON PERFORMENCE OF GRADED TUBERS AND YIELD IN POTATO

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ABSTRACT

Experiments were conducted with four potassium levels (50, 100, 150 and 200 Kg K_2O ha $^{-1}$) and six techniques of application (full dose as basal, three fourth dose as basal + one fourth as top dressing at 30 days after planting, half dose as basal + half as top dressing at 30 days after planting, half dose as basal + half as top dressing at 50 days after planting, one third dose as basal + one third as top dressing at 30 days + one third as top dressing at 50 days after planting and half dose as top dressing at 30 days + half as top dressing at 50 days after planting) along with control during 2014-15. The weight, number and yield of large and medium sized tubers significantly improved with an increase in K_2O levels upto 200 kg ha^{-1}. Half dose of K as basal and half as top dressing at 30 days after planting (DAP) proved to be the best.

KEYWORDS: 50 Days after Planting, Large and Medium Sized Tubers, Half Dose of K

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Original Article

INTRODUCTION

Yield maximization of potato is very essential in Indian agriculture, due to agro-economic and population factors. Potassium is one of the most important elements required for this crop as it plays a significant role in tuberisation apart from keeping up plant growth [Darwish *et al*., (2004); Dan and Thind, (2005); Zelalem *et al*., (2009); Bidari and Hebsur, (2011) and Singh and Lal, (2012)]. Study was performed with respect to phosphorous on yield and tuberization characteristics of potato by Sharma *et al.* (2011) and nitrogen on yield and tuberization characteristics of potato by Kumar and Trehan (2012) Sakia and Deka (2006), Tambascio *et al.*(2014). Sahu *et al*.(2014) also carried out such investigations in order to improve the potato yield and quality using N/P/K or combinations of these elements.

However, the information on potassium requirement and its application technique in potato is somewhat lacking. Therefore, the present investigation was carried out to find out an optimum dose of potassium fertilisation as well as a suitable technique of its application.

MATERIALS AND METHODS

The experiments were conducted at a farmer's field, Vill.- Dafi, P.O.- Dafi, Varanasi-221011, during winter seasons of 2014-15 on sandy loam with pH 7.6. The treatments comprising all combinations of four levels of potassium (as muriate of potash) viz., 50, 100, 150 and 200 kg K_2O ha^{-1}, six techniques of potassium application viz., full dose as basal (T_1) , three forth dose as basal + one fourth as top dressing at 30 days after planting (T_2) , half dose as basal + half as top dressing at 30 days after planting (T_3), half dose as basal + half as top dressing at 50 days after planting (T_4), one third dose as basal + one third as top dressing at 30 days + one

third as top dressing at 50 days after planting (T_5) and half dose as top dressing at 30days + half as top dressing at 50 days after planting (T_6) along with control were laid out in randomized complete block design with three replications. The tubers of cultivar Kufri Badshah were cut into pieces (25-30 g) having 2-3 healthy buds and planted on 5th and 10th of November during 2014-15, respectively at spacing of 60 cm × 60 cm. The net plot size was 3 m × 3 m. A uniform dose of 120 kg N (as urea in two splits) and 80 kg P_2O_5 (as single super phosphate) ha^{-1} was applied to the experiment. Recommended cultural practices were followed. The harvested tubers were grouped into three grades viz., small (below 3.75 cm), medium (3.75-5.00 cm) and large (above 5.00 cm) on the basis of diameter. The data on yield and its attributes were recorded and statistically analyzed.

RESULTS

Potassium fertilization conferred significant influence on number and yield of different grade of tuber as well as total yield (Table 1). Progressive increase in large and medium sized tuber numbers was observed with an increase in K levels between 50 and 200 kg K_2O ha^{-1}. The higher levels of K significantly reduced the number of small sized tuber.

The yield of large sized tubers significantly increased up to 200 kg K_2O ha^{-1}. The improvements were 63.18, 24.64, 11.35 and 9.02 per cent for large sized and 81.27, 31.45, 9.75 and 7.08 per cent for medium sized tubers with K levels from 0 to 50, 50 to 100, 100 to 150 and 150 to 200 kg ha^{-1}, respectively. The yield of small sized tuber reduced with increasing potassium doses and the level was recorded with 200 kg K_2O ha^{-1} (26.09 q ha^{-1}). Under sized tubers were more with control.

Increasing K levels improved the total yield, the highest being 200 kg K_2O ha^{-1} (237.14 q ha^{-1}). The mean weight of large and medium sized tubers was significantly higher with 200 kg K_2O ha^{-1} compared to other levels (Table 1). Increasing doses of potassium showed decreasing mean weight of small sized tubers.

Application of half dose of potassium as basal and the rest half as top dressing at 30 days after planting (T_3) had significantly greater number and yield of large sized tubers compared to T_1, T_3, T_4 and T_6. Similar effect was observed with medium sized tubers also. Application of entire potassium dose either as basal (T_1) or as top dressing (T_6) yielded significantly more under sized tubers.

The maximum total yield (225.54 q ha^{-1}) was recorded with T_3 which was significantly higher over T_1, T_4 and T_6 . The mean weight of different grade tubers was also significantly affected by techniques of K application and it was highest with T_3 in case of large and medium size tubers while small size tubers showed higher mean weight with T_6.

DISCUSSIONS

Potassium application positively influenced the number and yield of large and medium sized tubers [Zelalem *et al*. (2009); Bidari and Hebsur (2011)]. An experiment was conducted to find suitable dose of potassium for potato cultivar Kufri Pukhraj for optimum yield under different nitrogen levels by Singh and Lal (2012). From the present observations we found that the total yield of potato showed significant improvement with increasing potassium applications due to enhanced metabolic activities within the plant, at higher K rates, which brought about better plant growth and rapid development of tubers resulting in higher yield of large and medium grade tubers, thus positively affecting the total yield. These results are in conformity with the finding of earlier workers [Singh and Lal, (2012)]

The positive response of mean weight in case of large and medium sized tubers to potassium fertilization, conforms the findings of Zelalem *et al*.(2009).

T_3 resulted in significantly higher yield and mean weight of both large and medium grade tubers because of better plant vigour gained owing to proper potassium supply throughout the period of growth with this technique. The higher total yield of tubers with T_3 was due to an increase in number and yield of large and medium sized tubers. These results are in conformity with the findings of Zelalem *et al*.(2009) and Singh and Lal, (2012)

CONCLUSIONS

Application of 200 kg K_2O ha $^{-1}$ in two split doses, half as basal and the rest half as top dressing at 30 days after planting was beneficial for the better performance of potato cultivars Kufri Badshah.

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APPENDICES

Table 1: Effect of Levels and Techniques of Application of Potassium on Yield and its Attributes in Potato Cv. Kufri Badshah

Treatment	Number of Tubers (M^{-2})			Yield of Tubers (Q Ha^{-1})			Total Yield (Q Ha^{-1})	Mean Weight of Tubers (G)		
	Large Size	Medium Size	Small Size	Large Size	Medium Size	Small Size		Large Size	Medium Size	Small Size
Potassium levels Kg K_2O ha^{-1}										
50	4.32	4.53	10.39	86.60	51.79	54.21	192.53	118.6	52.3	24.7
100	5.83	5.61	9.00	107.94	68.08	44.92	220.85	132.7	59.9	24.4
150	6.49	6.29	8.16	120.19	74.72	36.25	231.16	139.1	64.4	19.6
200	6.96	6.93	7.10	131.03	80.01	26.09	237.14	143.9	67.1	14.6
C.D. (P=0.05)	0.11	0.09	0.41	3.78	2.87	2.29	5.39	3.5	2.2	2.2
Application techniques										
T_1	5.71	5.58	8.94	107.82	66.63	43.55	218.00	131.4	59.4	22.7
T_2	5.99	5.93	8.56	109.16	67.01	39.86	221.53	134.3	61.3	20.6
T_3	6.15	6.15	8.22	118.54	72.44	34.55	225.54	137.5	63.4	19.7
T_4	5.85	5.86	8.79	109.07	67.88	41.37	218.33	132.6	59.7	22.0
T_5	6.07	6.03	8.35	116.00	71.02	37.81	224.88	136.0	57.6	20.2
T_6	5.67	5.48	9.14	104.87	64.31	45.06	214.24	129.3	58.1	23.8
C.D. (P=0.05)	0.12	0.09	0.39	3.72	2.84	2.26	5.44	3.0	2.2	2.2
Control	2.59	2.99	10.78	53.07	28.57	70.02	151.66	108.8	41.1	29.5
Treatment	5.91	5.84	8.66	111.12	68.39	40.37	220.42	133.5	60.9	21.2
C.D. (P=0.05)	0.61	0.38	1.02	26.52	20.24	16.15	38.40	22.6	14.7	N.S.